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PUBLIC WORKS.

CITY COUNTY STATE

A COMBINATION OF

"MUNICIPAL JOURNAL" and "CONTRACTING"

RESULT OF FROST ACTION ON A GRAVEL ROAD IN MAINE

THE SAME ROAD AFTER SURFACE TREATMENT WITH TAR

Articles on the construction and maintenance of gravel roads will appear in next week's issue.

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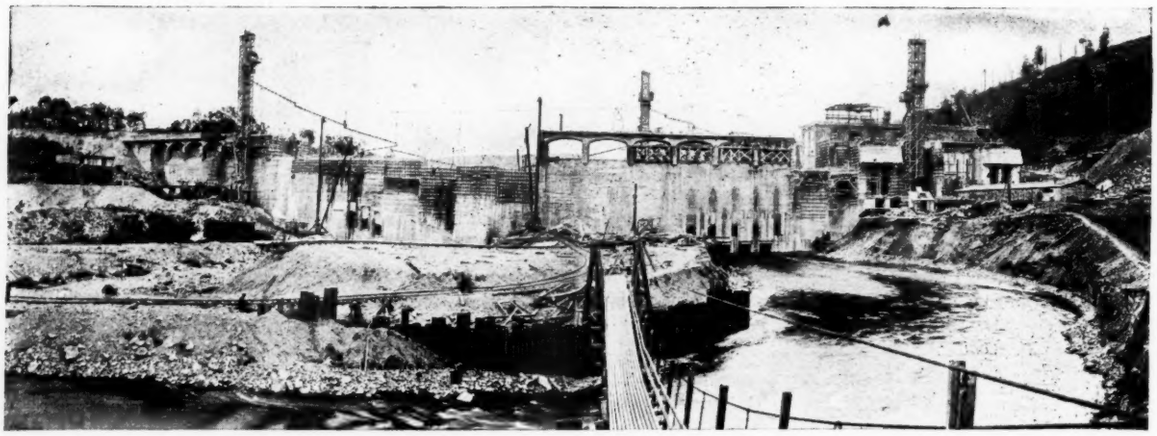
Road Experiments by the Bureau of Public Roads
Electric Light and Power Stations
The National Construction Situation
Casting and Steaming Reinforced Pipe

OCTOBER 16, 1920



Obstinate driving and battering from heavy ice floes failed to injure this Lackawanna Steel Sheet Piling

The picture above gives a good idea of the 'Stevenson Development' of the Connecticut Light & Power Co., for obtaining hydraulic power at Stevenson, Conn.

Building of the dam and power house foundations required 30 to 50 feet of excavation through compacted sand and gravel.

The most difficult of this excavation, that in the center of the gorge, was accomplished first, by employing three 80 by 30-foot braced enclosures of Lackawanna Steel Sheet Piling in spliced lengths, and the remainder by open trench work, in which excavation was speeded up and greatly decreased in quantity by utilizing shorter lengths of Lackawanna Steel Sheet Piling for the trench sides.

The first of the three large cofferdams was subjected to a severe ice floe which finally over-topped the enclosure. After the flood had subsided the cofferdam was found to be undamaged, save for slight bending at the upstream end, which was easily forced back to vertical position.

The Lackawawnna Steel Sheet Piling in the sides of the main excavation trench was supported for the most part by diagonal struts to the rock, but where the excavation was so deep that bracing was needed before rock could be reached a rather novel scheme of support by tension walls was employed.

Mr. E. H. Burroughs, Assistant Engineer for the Contractors, J. A. P. Crisfield Contracting Co., states that their results from the use of Lackawanna Steel Sheet Piling have been very satisfactory and that it has been a great aid in combating difficult conditions.

We Also Offer for Better Construction

Elcannes

Concrete Reinforcing Bars

The Elcannes Bar combines maximum bonding surface, minimum weight, and uniform strength. The bonding surface is 15 per cent greater than that of a plain square bar of equal nominal size. The cross-sectional area is practically the same at all points and the regular surface facilitates fabrication and handling.

Lackawanna Steel Company

General Sales Offices and Works - Lackawanna, N. Y.

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BOSTON	CLEVELAND	ST. LOUIS
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CHICAGO	NEW YORK	

Licensees for the Manufacture of Lackawanna Steel Sheet Piling: For Great Britain and British Colonies in Eastern Hemisphere: Cargo Fleet-Iron Co. Ltd., Middlesbrough, England. For France, Italy, Spain, French Colonies and Protectorates, Italian Colonies and Spanish Colonies in the Eastern Hemisphere: Cie des Forges & Acieries de la Marine et d'Homecourt, Paris, France.

Sole Exporter for Other Countries: Consolidated Steel Corporation, 165 Broadway, New York.

474-E

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PUBLIC WORKS.

CITY **COUNTY** **STATE**

A Combination of "MUNICIPAL JOURNAL" and "CONTRACTING"

Vol. 49 **FLORAL PARK, OCTOBER 16, 1920** **No. 16**

Paving North Broad Street, Philadelphia

Sheet asphalt laid in 45-foot center strip while sewers were being built on both sides, after which the surface above them was paved by subsequent operations.

During the summer just past, a sheet asphalt pavement was laid over about 1¼ miles of North Broad street, Philadelphia, where the roadway has a total width of 69 feet and where there are two trolley tracks. The work was done under the direction of the Bureau of Highways, Department of Public Works, Fred C. Dunlap, chief of bureau, and Chas. F. Puff, Jr., principal assistant engineer in charge of construction. The work was executed by the Barber Asphalt Company for a contract price of about $201,000.

The work involved about 4,000 yards of earth excavation to a maximum depth of 6 feet. The upper 4 feet was removed by a Thew steam shovel and it was completed to sub-grade by a Keystone grader machine.

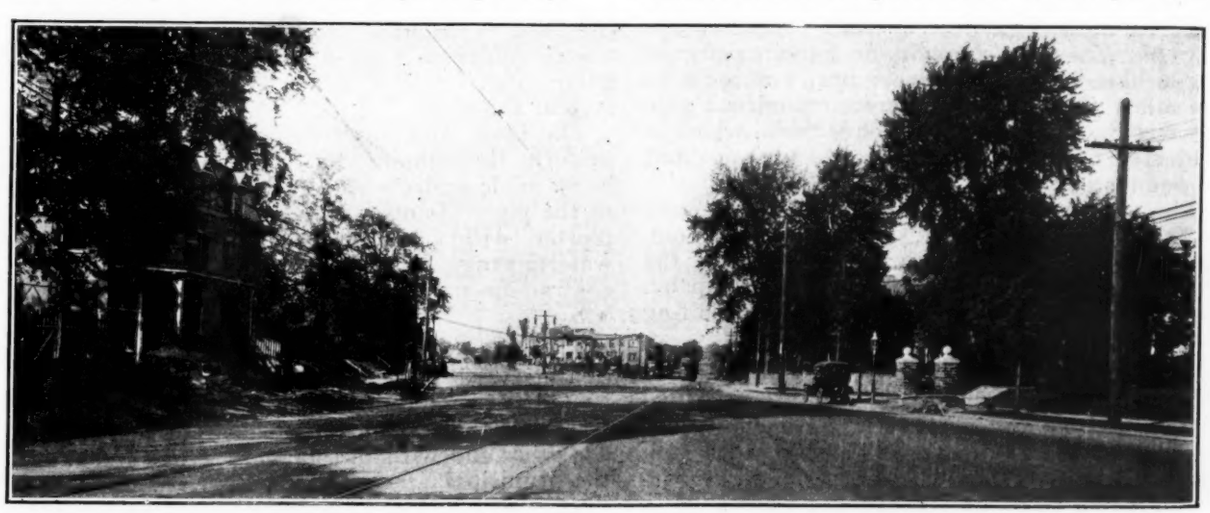
The base course contained about 9,150 cubic yards of 1:3:6 Portland cement concrete, made with graded sand of a maximum size of ¼ inch and graded stones from ¼ to 1½ inches in diameter. It was mixed at the site in one Ransome and two Foote machines, which together yielded an average product of 200 cubic yards per day.

BINDER COURSE

The hot binder mixture was transported a maximum distance of 7½ miles in clean, tight steel carts covered with canvas, deposited at a temperature of 200 to 325 degrees on the carefully cleaned concrete surface, and immediately rolled to a thickness of 1 inch with a 1-ton, a 5-ton and a 7-ton Iroquois Iron Works rollers successively operated, each roller being operated continuously at a rate of not more than 300 square yards per hour and traveling both transversely and longitudinally of the roadway. The rollers were kept moistened with water to prevent adhesion, and great care was taken to deliver the binder in time for it to be rolled and finished on the same day. For a distance of 8 inches around all hydrants, manholes and other structures penetrating the binder, the latter was compacted with hot tampers weighing 25 pounds and having a bearing surface of not more than 48 square inches.

SURFACE COURSE

On the finished binder course there was spread a surface course composed of 9.5 to 13.5 per cent



NORTH BROAD STREET, PHILADELPHIA, AT INTERSECTION OF YORK ROAD AND OAK LANE.

Entered as second class matter at the post office, Floral Park, N. Y., under the act of March 3, 1879.

of stone dust passing a No. 200 sieve, 18 to 36 per cent of sand passing a No. 80 sieve, 20 to 50 per cent of sand passing a No. 40 sieve, 8 to 25 per cent of sand passing a No. 10 sieve and a maximum of 10 per cent passing a No. 4 sieve. The sand and asphaltic cement were heated separately to a temperature of 300 degrees Fahrenheit, Portland cement or stone dust added to the hot sand and thoroughly mixed, and the asphaltic cement added and mixed, transported a maximum distance of 7½ miles from the asphalt plant to the work in covered receptacles, poured over the dry, clean surface of the binder at a temperature of 250 to 280 degrees, raked and rolled in the same manner as the binder to a finished thickness of 1½ inches. It was first rolled by a 2½-ton roller giving a compression of approximately 125 pounds per inch width of tread, followed by a roller with 200 pounds per inch, operated equally in longitudinal and transverse directions at the rate of not more than 200 square yards per hour. An area of 8 inches around all structures penetrating the pavement and where it was inaccessible to the rollers was finished with hot 25-pound rammers with a bearing area of not more than 48 square inches. All of the surface was tested by a 10-foot straight-edge. All of the depressions, projections, joints and any honeycomb surfaces were smoothly ironed to grade and finished by Portland cement swept over the entire surface, traffic being prohibited for at least three hours after its completion.

The work was executed by an average force of 45 men and a maximum of 65 men, who completed a maximum of 2,100 square yards in one 8-hour day. One asphalt gang of 15 men and one concrete gang of 22 men were employed besides the excavating men, helpers, etc.

While the 45-foot strip in the middle of the road, including the street-car tracks with granite block pavement, were being laid, a 24-inch brick sewer and a water main were being laid on each side of the road and, after their completion, the paving gangs returned to the starting point and simultaneously paved the two side strips, each 12 feet wide, over the sewers and water mains. At the intersection of Broad street and York road, where there was a diagonal crossing, the two trolley tracks were separated by a 20-foot strip of Filbertine pavement.

SPECIAL TEMPORARY CONSTRUCTION

At the intersection of Broad street with Oak lane (the old New York route), where the road was not legally opened, a satisfactory connection with the intersecting street was made, permitting the new pavement to be continuous and effecting a considerable economy over making the regular construction and subsequently removing and rebuilding it. Here a strip 20 feet wide was built with a foundation of 5 inches of rolled slag, 1½ inches of binder and 1½ inches of surface course, affording about 1,600 square yards of uniform and satisfactory surface at an estimated saving of about $1.50 per square yard.

Casting and Steaming Reinforced Pipe

Ten miles of 5½-foot pipe, costing $1,350,000 when laid, was fabricated and seasoned in the contractor's yard at Transcona, Canada.

The 99-mile aqueduct with a capacity of one hundred million gallons of water daily for the city of Winnipeg, Canada, is built chiefly of horse-shoe-shape concrete conduit, but includes ten miles of reinforced concrete cylindrical pipe 5½ feet in diameter and 8 inches thick, which is subjected to a static working pressure of about 30 pounds per square inch.

The pipe was made in a special casting yard at Transcona by the Canada Lockjoint Pipe Company, Limited, for the general contractor, the Winnipeg Aqueduct Construction Company, which executed the work designed by Consulting Engineer James H. Fuertes.

DESIGN

The pipe was made with a mixture of 700 pounds (3.8 cubic feet) Portland cement to one yard of 1:1½:2½ concrete, using very well graded aggregate and mixed to a jelly-like consistency that easily flowed to place when slightly puddled.

The pipes are reinforced, 2 inches from the outer surface, by spiral coils of ½ to ⅝-inch square steel rods wired to longitudinal rods and enclosing cylindrical reinforcement of heavy woven American Steel & Wire Company's triangular mesh fabric 2 inches from the inner surface of the pipe.

The inner and outer cylindrical surfaces are uniform throughout, the hub and spigot joints being made entirely within the regular thickness of the pipe. Joints were made with 1:1 cement mortar, with crimped copper sleeves providing watertightness under longitudinal expansion and contraction movements.

CASTING YARD

The 500 by 2,600-foot level area used for a casting yard had standard gauge tracks, connected at one end of the yard with the main-line tracks of the Canadian Pacific Railroad and at the other end with the standard gauge tracks of the Municipal Service Line paralleling the aqueduct, over which the finished pipe were delivered to required positions alongside the trench. On the longitudinal axis of the yard there was installed 1,100 feet of 8-foot gauge track connect-

ing the mixing plants at both ends of the yard and serving for the operation of the two pipe-casting travelers. About 150 feet each side of this track there was a parallel standard gauge track for loading and shipping the finished pipes.

Between the traveler track and each loading track there were located 144 heavy concrete bases on which the pipe forms were set and the pipes were cast.

At each end of the yard there was a low trestle over which cars of graded sand and gravel were delivered to storage bins of an aggregate capacity of 3,000 yards, which were provided with steam pipes to warm the aggregate in the winter, and from which there were supplied by gravity a battery of four Little Wonder concrete mixers, each of 10-foot capacity.

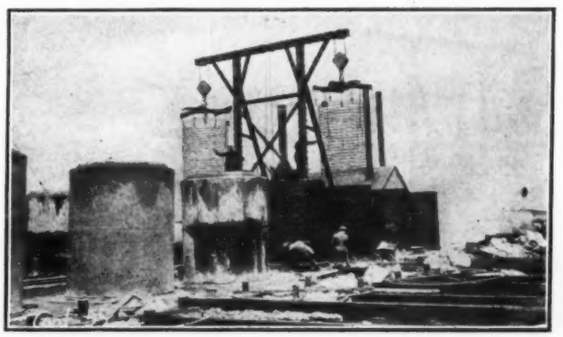
The contractor's offices and service buildings were located midway between the mixer plants, and reinforcement storage and assembling yards were located between the mixing plants and the ends of the casting yards, which were symmetrical about both longitudinal and transverse axis.

CASTING THE PIPES

For interior reinforcement, the woven mesh was formed on collapsible mandrels, the overlapping edges were wired together, the fabric was reinforced by rods wired on when necessary, and the cylinders were stored until required for use. The exterior reinforcement was made from straight rods bent at the yards over mandrels to form the spirals that were wired to longitudinal rods, making complete skeletons placed as units in the forms. Each form was assembled on a grooved cast-iron bottom piece on the concrete slab. The collapsible steel interior form was set on it and carefully centered. The concentric fabric reinforcement was placed around it and seated in the annular groove in the bottom casting, which was then filled with sand. The skeleton reinforcement was centered over the fabric reinforcement and the exterior steel form, consisting of two longitudinal halves connected by pivoted latches, was set in place.

The top of the inner form was closed by the working platform set on it, and grout was poured into the bottom of the form, after which the form was filled with concrete to a point near the top, when mortar was added and a steel spider centered with the form to support the joint mould and the copper sleeve.

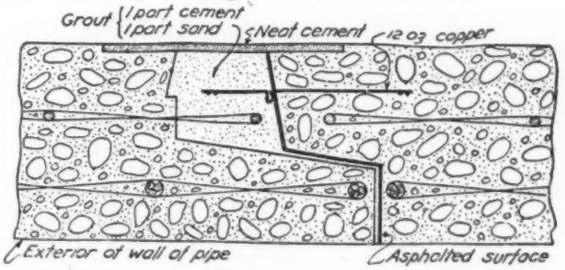
Each battery of four mixers discharged into special 1½-yard conical steel buckets set in a pit and handled by tackles suspended by the overhead horizontal arms of the two steel travelers on the center track, along which it was traversed by its hoisting engine winding an anchored line. The concrete was deposited in the center of the working platforms and thence filled by hand into the forms and tamped. The discharge of the concrete from the buckets to the platforms was regulated by the ball valves at the bottoms of the buckets that were operated by exterior levers. Each traveler delivered concrete to two forms simultaneously and was operated by ten men, including engine man and concrete gangs, and cast pipes at the rate of 36 pieces, or 288 lineal feet, per day.



PLACING REINFORCEMENT IN FORMS

CURING AND HANDLING THE PIPES

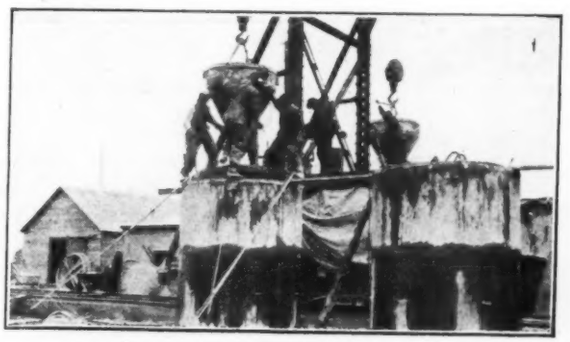
As soon as the pipes had been cast, the forms were covered by canvas jackets laced up and down the vertical joint and secured to the concrete base. The canvas hood, supported by wooden arms attached to the spider so as not to displace the light copper sleeve, was placed on top of the cylinder and laced to it. Live steam was admitted to the interior of the pipe through one center jet and four equi-distant circumferential jets piercing vertically through the concrete base.



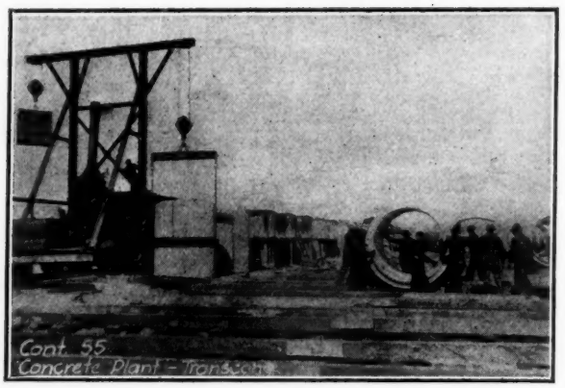
WATERTIGHT EXPANSION JOINT WITH EXTENSIBLE COPPER SLEEVE

When the pipes were twenty-four hours old the jackets were removed and the forms were stripped, cleaned, assembled, and used on another set of pipes. The jacket and hood were replaced and steam was again turned on for two or three days before the pipes were removed from the concrete bases and stored on the skids.

The pipes were lifted from their bases by a horizontal beam about 7 feet long attached to a hoisting tackle on the traveler suspended from one end of the traveler cap, and counterweighted by a balance box suspended from the opposite end of the cap.



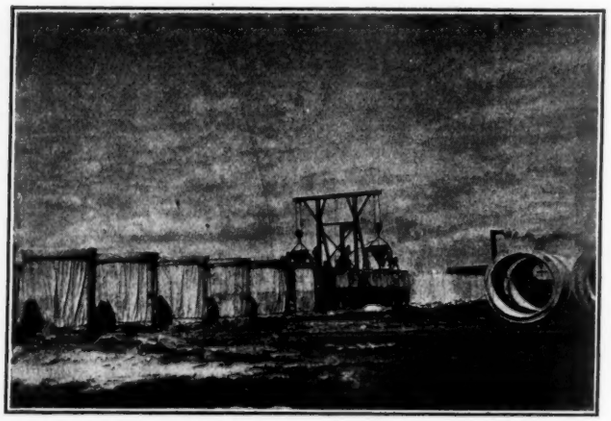
DELIVERING CONCRETE TO WORKING PATFORMS ON FORMS.



LIFTING STRIPPED PIPE FROM CASTING SLAB

At each end of the hoisting beam there was attached one end of a chain that was wove around sheaves at opposite ends of a flexible semi-circular steel band placed horizontally on the outside of the pipe midway between the ends.

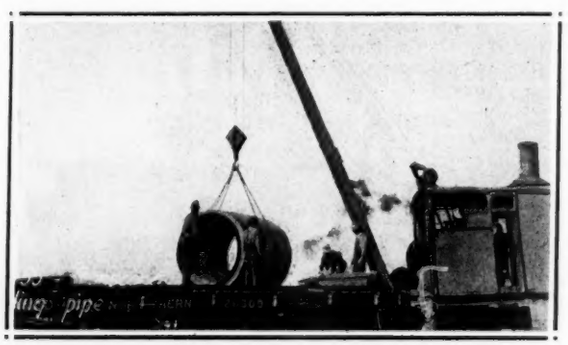
Putting the hoisting strain on the chain developed a tension that pulled this band tight and produced sufficient friction to enable it to lift the pipe section free of the base, after which it



PIPES ENCLOSED IN CANVAS HOODS AND JACKETS TO RETAIN STEAM.

was easily revolved about the center of gravity in a line passing through the chain sheaves, and when in a horizontal position was lowered to rest on wooden skids transverse to the traveler track.

The pipes were first rolled to the outer ends of these skids and afterwards the space between them and the derrick track was filled with additional pipes stored until required in the trench, when they were removed from the outer ends of these skids by locomotive cranes that transferred them to cars on the service track. While the pipes were seasoning in the yard or on the skids, they were periodically sprayed with a water jet to prevent dehydration.



LOCOMOTIVE CRANE LOADING PIPE ON CARS

Charleston's Way of Getting an Incinerator

The city Department of Health and prominent citizens of Charleston, W. Va., have put it emphatically before the citizens that the situation as to garbage disposal in that community has reached the point where immediate action is imperative. At a special meeting of the Chamber of Commerce held a short time ago, a special committee on garbage disposal made its report and the Chamber of Commerce unanimously adopted resolutions urging the necessity of protecting the health of the people and guarding against difficulties with the Federal government by providing some sanitary method of garbage disposal. Dr. R. A. Ireland, chairman of the special committee, stated that 6,000 out of 10,000 families in that city were spending 25 cents a week for having their garbage removed, or a total of $78,000 a year. The Chamber of Commerce appointed a committee of ten to make arrangements for financing the project, and it was thought probable that the plan adopted would be that by which the city purchased its fire apparatus, when the citizens underwrote the amount necessary. It is believed there is enough popular opinion in favor of the project to make it perfectly possible to get the citizens to underwrite the amount necessary to erect a modern incinerating plant, furnishing the funds for construction, which will later be returned to them by the city.

Proposals For Portland's Garbage Disposal

Four proposals have been made to the city of Portland, Ore., to erect garbage-disposal plants and to operate them, or to allow the city to operate them upon completion. The Pacific Conservation Company of San Francisco and Los Angeles made two proposals. In the first bid the company offers to erect a reduction plant equipped with a Cobwell system and sell it to the city on a cost plus 1 per cent basis, with a guarantee that the plant would not cost to exceed $350,000.

In the second proposal made by the same company, which is but a tentative plan, an offer is made to erect and operate the plant and also take over the collection of garbage in Portland, providing the city will grant the company a franchise for the exclusive collection of garbage, and pass an ordinance requiring the segregation of garbage.

The company offers to make two collections of garbage weekly, with a monthly charge of $1, and will pay the city $20,000 a year for the privilege. This amount, together with a saving

estimated by Commissioner Bigelow at not less than $20,000 now spent in the operation of the municipal incinerator, would net the city approximately $40,000 yearly on the proposition.

The Washington-Oregon Nu-Fuel Company offers to install plants for the disposal of all garbage and combustible material, paying the city 50 cents a ton for all such material delivered to the plant. This offer is made with the provision that the city establish a municipal garbage collection system.

Another offer was made by the Pacific Cremation Company, which included the erection of a new incinerator for the city at a cost of $62,000 for one 50-ton furnace, or $134,000 for four 50-ton furnaces.

The same company also offers to remodel the present plant, and install three furnaces for $60,000.

The bid for the sale of new furnaces, with the exception of the last named offer, includes the erection of new buildings in connection with the incineration plant.

Report on Philadelphia's Water Supply

The committee appointed by the mayor of Philadelphia to study the city's water supply, submitted its report the last week in September. The committee does not report very encouragingly concerning ground water supply, finding this to be small in quantity and highly impregnated with mineral water, making it unsuitable for domestic or industrial purposes; although final conclusions are deferred until certain test wells have been sunk, for which contracts are about to be let. They report, however, that during the next five or six years the supply must be extended, and recommend the construction of an impounding reservoir on Perkiomen creek at an estimated cost of $8,000,000; improvements in and extensions to the Delaware river supply works at a cost of $6,000,000 and to the Schuykill river supply works at a cost of $4,000,000. They also recommend the expenditure of $8,000,000 for the extension of the distributing mains and construction of a distributing reservoir for the northeastern part of the city, $5,000,000 for extensions and betterments to existing distribution reservoirs and main pipe lines, and $4,000,000 for general improvements essential for the safe maintenance of the plant. These should be completed during the next five or six years, but during the next fifty years other extensions should be made at an estimated cost of $134,900,000 (these costs being based on present costs of material and labor). These future expenditures consist of $56,073,000 for reservoirs and headworks, $50,819,000 for aqueducts to bring the water to the city, and $28,000,000 for changes in filtration plant and the distribution system. These recommendations for the half-century period are based on an estimated population fifty years hence of 3,250,000.

The ground water supply had been reported upon at the express request of the mayor, but other citizens have for some time been urging bringing a supply from distant mountain regions. Concerning this, the commission remarked that the general public were accustomed to think of a mountain supply as the clear, cool water which they find in mountain springs. But before mountain water can be accumulated in sufficient quantity to furnish any material proportion of the quantity needed by a large city, it has passed through regions or conditions which cast doubt upon its safety, has received the wash-off of the soil so that its clarity has been damaged, and when impounded in reservoirs its coolness quickly disappears. The water of the Lehigh and Delaware rivers above the Water Gap is at times turbid, has a high color or vegetable stain, and would be subject to dangerous pollution; and to be satisfactory for a public supply it would need to be treated to remove these objectionable qualities. The cost of bringing the water would be enormous, and the quality would probably be no better than could be obtained much nearer at hand at a very much lower cost.

Water Bonds in San Francisco

An amendment to the charter of the city of San Francisco is to be voted upon in that city which would provide for withdrawing water bonds from the 15 per cent legal limit of bonded indebtedness, which appears to be necessary if the city is to complete any of the water projects under discussion or even already started, as the city has already gone within about $32,000,000 of its legal limit of indebtedness. The vote on the amendment does not include any authorization for issuing bonds but merely makes it possible for the citizens to vote the necessary bonds for water projects by casting a two-thirds electoral vote in their favor.

Testing Water Meters in Series

In a paper before the New England Water Works Association, J. E. Garratt, office engineer of the Board of Water Commissioners of Hartford, Conn., discussed the question whether water meters would show the same percentage of registration whether tested singly or in series of two, three, ten or any number.

He first called attention to the fact that, when the discharge is indicated as the flow through a ⅛-inch, 1-16-inch or other size orifice, the matter of pressure is overlooked. If the pressure in a given laboratory is always the same and the meters are tested singly, no error may be involved in this. There is, however, a certain loss of head in passing through a meter, and four times as much loss in passing through four meters. Consequently, where a number of meters are tested in series, the head on the testing orifice is less than where only one meter is tested and consequently the volume of flow is less. He therefore emphasizes the fact that in all meter testing the flow should be designated as so many gallons or cubic feet or pounds of water per minute and not as the flow through an orifice of stated size.

Given this method of indicating results, and the percentage of registration is entirely indepen-

dent of whether meters are tested singly or in series. Where the testing is made at very low rates the loss of head is insignificant and the effact of multiple testing on orifice flow is insignificant, but as the head increases beyond 1-40 of a cubic foot per minute for a ⅝-inch meter, the difference becomes more apparent.

Water Works Extension to Cost $5,750,00

The Swan Lake system of extensions of the water supply of Seattle will cost approximately $5,750,000. This was the estimate submitted to the council utilities committee by City Engineer Dimock. The total amount expended to date is $400,533.

When completed the Swan Lake project will furnish a water supply sufficient to meet the needs of the city for 25 years, it is estimated. The project includes the construction of a dam at the lower end of Swan Lake, which will create a reservoir into which water from Cedar river will be diverted, a pipeline leading from the reservoir to another reservoir in the city, and the construction of a storage reservoir within the city limits.

Bethlehem Buys Water Works

The city of Bethlehem, Pa., on September 28, became the owner by purchase of the plant and property of the Bethlehem City Water Company. The city paid $1,700,000 for the property, which sum had been obtained by the sale of 4½ per cent water works bonds, from the sale of which it received par value and accrued interest.

The Fourth International Road Congress

By Arthur H. Blanchard *

The author, who has played a prominent part in the first three International Road Congresses, describes the purposes and accomplishments of these Congresses and presents a plea that highway engineers urge Congress to enter the United States as a member of the Permanent International Association of Road Congresses.

The First International Road Congress was held in Paris in 1908. At this Congress, the Permanent International Association of Road Congresses was formed with headquarters in Paris. The Second Congress was held in Brussels in 1910.

The Third International Road Congress was held in London in 1913, at which time there were 3,793 members of the association. The business sessions of the Congress occupied about one week and were devoted to a thorough discussion of the subject matter of 123 reports pertaining to the 19 topics on the program of the Congress. During the final business session, progressive conclusions relative to each topic were adopted by the Congress. The Government of the United States was the only world-power which was not a member of the association when the Third Congress was held. The records of the Third Congress indicate that the following important countries were members of the association: Austria, Belgium, France, Germany, Great Britain, Italy, Japan, Norway, Portugal, Russia, Spain, Sweden and Switzerland. Of the smaller countries, it is interesting to note that our neighbors, Cuba and Mexico, sent Government delegates to the London Congress and are Government Members of the association.

*Professor of Highway Engineering and Highway Transport, University of Michigan, Ann Arbor, Mich.

The International Commission of the Permanent International Association of Road Congresses, at its meeting held in Paris on June 21, 1920, unanimously voted to accept an invitation in the United States in 1922 provided an invitation from the United States Government is received by the Executive Committee of the association before January 1, 1921. If an invitation is not received from the United States on or before December 31, 1920, the invitation from the Italian Government will be accepted. As a regulation of the association stipulates that an International Congress cannot be held in a country whose Government is not a Permanent Member of the association, it will be necessary for the United States Congress, during November or December, 1920, to pass an appropriation which will provide for the annual subsidy of the United States as a Government Member of the association and which will enable the Secretary of State to extend an official invitation to the association to hold the Fourth International Road Congress in the United States in 1922.

The object of the association is to promote progress in the improvement of highways and the efficiency of highway transport throughout the world. The work of the association consists in organizing International Road Congresses, publishing reports, papers, proceedings and other documents and collecting information relative to

highway improvement and highway transportation.

The membership of the association consists of representatives of Governments, delegates for corporations and individual or private members. The business affairs of the association are managed by the Permanent International Commission, which is composed of members representing the various Governments having membership in the association. Each Government has the right to one representative for each 1,000 francs of its total annual subsidy, provided, however, that the number of representatives from any one Government does not exceed fifteen.

Individual or private members pay annual dues of 10 francs, or compound for a life subscription by the payment of one sum of 125 francs Due to the current rate of foreign exchange, it is practicable for Americans to become Life Members by the payment of the subscription of 125 francs through the medium of a bank draft, which will cost, at the present time, between $9.50 and $10. Life membership dues should not be sent by an International Postal Money Order, as an order for 125 francs will cost approximately $25. Bank drafts should be made payable to the Permanent International Association of Road Congresses and be sent to Professor Paul LeGavrian, General Secretary, Permanent International Association of Road Congresses, 1 Avenue d'Iena, Paris, France.

Individual members receive, free of charge, all of the publications of the association, including papers, reports and proceedings of Congresses, which, in times of peace, are held triennially. The reports and proceedings of the Third International Road Congress measure, when stacked, about 6½ inches by 9½ inches by 8 inches in height. The reports contain reliable information pertaining to the progress in highway development and highway transportation in all important countries and hence serve as an encyclopedia of foreign practice. Members also receive the Bulletin of the association, each issue consisting of forty to fifty pages devoted to official notices, minutes of meetings of the International Commission and the Executive Committee, and reviews relative to highway improvement and highway transport in different countries. All the literature, sent to American members, is printed in English.

The International Association should be supported by Americans who wish to see the science and art of highway improvement and highway transport rapidly develop throughout the world, who believe in an international medium for the exchange of opinions and conclusions, and who wish to be well informed relative to progress in highway engineering and transportation in foreign countries. Americans should not be satisfied with joining the association as individual members. Although every courtesy was extended to the United States members of the association at Paris, Brussels and London, nevertheless every American who has attended an International Road Congress has wished to apologize because his Government was not a Permanent Member of the association. Considering the phenomenal development of highway improvement and highway transport in the United States and the active part which the United States Government is taking in highway construction through the medium of the Federal Aid Act, it requires no elaborate arguments to demonstrate the advisability of the United States Government becoming a permanent member of the association. The status of the United States as a leading world-power demands that its annual subsidy should be the maximum allowed by the constitution of the association, that is, 15,000 francs, which will provide for fifteen representatives of the United States on the Permanent International Commission. It is the duty of every American who wishes to support the work of the International Association and to have an International Road Congress held in the United States in 1922 to write to his representatives in Congress urging them to vote favorably on an appropriation to provide for the annual subsidy of the United States as a Government Member of the Permanent International Association of Road Congresses.

Road Experiments of the Bureau of Public Roads

The Bureau of Public Roads of the United States Department of Agriculture is conducting a series of experiments which promises to be of great value to highway engineers. These experiments will continue for several months or years, but already sufficient has been learned to give an indication of the results. For instance, they indicate that increased speed of a vehicle equipped with hard rubber tires tremendously increases the impact which its wheels make on the roadway if there is any unevenness of the surface; and on the other hand, with pneumatic tires increased speed adds little to the impact. Trucks varying from 1 ton to 7½ tons have been used in the tests. A special device recorded the impact of each wheel as it made a 2-inch drop from a ledge built in the road surface.

Recent tests were made with a 3-ton truck carrying a 4½-ton load so placed that the total weight on each rear wheel was 7,000 pounds, of which 1,700 pounds was not supported by the springs while 5,300 pounds was so supported. This truck was equipped first with an old solid tire that had worn down to a thickness of 1 inch; then with a new solid tire 2½ inches thick; and finally with pneumatic tires 42 x 9 inches and inflated to a pressure of 142 pounds per square inch. The other conditions were the same in all the tests. The blows delivered when the speed approximated 5.7 miles per hour were measured as 11,600 pounds with the old tire, 9,400 pounds with the new solid tire and 7,100 pounds with the pneumatic tire. When the speed increased to 10.2 miles per hour the impacts were increased to 18,500 pounds, 14,100 pounds and 7,800 pounds,

respectively; while when the speed reached 14.6 miles the impacts increased to 26,500 pounds, 18,700 pounds, and 8,300 pounds. This shows that, with an increase in speed from 5.7 to 14.6 miles, impact from the old solid tire was increased about two and one-half times, that from the new tire about twice, and that from the pneumatic tire only about 17 per cent.

Another series of tests was made on slabs of pavement by means of a machine designed to give impacts equivalent to those described above, the unsprung weight being 1,500 pounds and the sprung weight 6,000 pounds. The tests were made by dropping the entire weight ⅛ inch 500 times, ½ inch 500 times, ⅜ inch 500 times and so on until the slab failed. The slabs were tested lying on a rather wet sub-grade. A surprising difference has been found in the strength of the different types of pavements tested. The total number of blows required to cause failure have varied from 67 to almost 2,000.

Another series of tests is being made to determine the relative wear of different kinds of pavements. The relative wearing qualities of hard and soft brick and of various kinds of stone blocks are brought out, comparisons made between grout and asphalt fillers for both brick and stone blocks, and the relative wearing qualities of concrete when mixed with various kinds of coarse aggregate.

Road Construction in North Carolina

The North Carolina Highway Commission now has under construction 57 projects of which the estimated cost is slightly over $7,000,000. These projects include 21 hard-surface roads totaling 114 miles, 35 gravel and sand-clay roads totaling 339 miles and a concrete bridge. Sixteen miles of hard-surface roads in six projects have been completed at a cost of $507,380, and 5 7miles of gravel and sand-clay roads at a cost of $202,693.

The work being done is spread quite generally over the state, more than half the counties having taken advantage of the Federal Aid offer. The largest amount of work being done in any one county is that in Buncombe county, where more than one-half million dollars' worth of construction is under way.

The Lee Highway

Virginia has the reputation of being one of the most backward states in the eastern section of the country so far as improved highways is concerned, but it is hoped by many of the citizens that conditions will be greatly improved within the next year or two. Last spring there was organized the Lee Highway Association to promote a transcontinental highway through the south, and permanent officers of the association were elected in September and Roanoke chosen as headquarters.

The highway is intended both as a memorial to Gen. Robert E. Lee and to serve the utilitarian purpose of connecting the north with the south by a single stretch of improved roadbed. Dr. S. N. Johnson, the general director, states his belief that the construction of this highway through the Valley of Virginia will result in the construction of many lateral roads and greatly increase the shipping of goods by truck throughout the state. The highway will naturally pass through Lexington, which is the burial place of both Gen. Lee and Stonewall Jackson. Because of the historic interest, scenic beauty and for practical purposes, the route has been fixed from New York, through Philadelphia, Baltimore and Washington to Alexandria and Winchester, and thence by the Valley of Virginia and East Tennessee to New Orleans. It is the intention, when this section has been completed, to extend the road to San Francisco by way of El Paso, San Diego and Los Angeles, making it the southern counterpart of the Lincoln Highway in the north.

Repairing Elizabeth's Bridge Piers

An examination of several bridge piers at Elizabeth, N. J., on the Elizabeth and Rahway rivers, made some months ago, showed that the concrete in them had disintegrated to a dangerous degree, the corrosion in some places extending to a depth of 6 inches from the face. The matter was referred to a committee who obtained the opinion of consulting engineers and chemists as to the cause of the damage and best remedy therefor. The zone of disintegration appears to be limited to the area between high and low water marks, and consequently repairs made in the ordinary way would require the building of a coffer dam around each pier or some other method of excluding the water until the concrete or other masonry used for repairs had set. This would be an expensive procedure.

Professor E. L. Conwell, a consulting chemist of Philadelphia, reported that analyses of the river water showed soluble salts of hydrochloric and sulphuric acids in considerable quantities. Also Elizabeth river water was found to contain from 20 to 200 times as much salt as was found in other streams of the state not exposed to industrial pollution.

One of those consulted was Ralph L. Shainwald, Jr., vice-president of the Standard Paint Company. He said that he found that crystals of salt formed in holes and crevices of the concrete, and in the considerable expansion accompanying crystallization, forced off flakes and particles of the concrete. He recommended chipping away all of the damaged surface and applying a coat of cement mixed with a compound which is both waterproof and acid-proof. This material can be applied by heating the surface of the piers to a high temperature with a blow-torch and applying the plaster, which will set rapidly and permit the repair to be made during the twenty minutes or so of extreme low tide when all of the damaged surface is exposed. He estimates that repairs made in this way will cost approximately $3,000, whereas the construction of coffer dams to permit concreting in the usual way would cost about $10,000. The County Board of Freeholders is reported to have decided to use acid-resisting and waterproof material for the concrete abutments to be used in connection with a proposed new street bridge on South Front street.

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Gravel Roads

As compared with concrete, bituminous concrete and other more durable roads, comparatively little has been written or reported concerning gravel roads, and yet the mileage of such roads constructed with Federal Aid in the United States during 1919, and also that during the three years, 1917, 1918 and 1919, exceeded by far the mileage of any other type of road other than plain earth roads and almost equaled the total of all other kinds, and the mileage of earth roads only slightly exceeded that for gravel. Owing to restrictions placed upon roads which receive Federal aid, it is probable that, could figures for all roads in the country be obtained, the showing made by gravel roads would be even better. In some states more than three-quarters of all the roads in the state are built of gravel.

Even taking the costs of the roads, we find that, although gravel is a very cheap road to construct as compared with the more durable ones, the total Cost of Federal aid gravel roads during the three years, 1917, 1918 and 1919, was two-thirds as great as that of all the other roads combined, omitting concrete. To give the exact figures, there was spent on Federal aid gravel roads $10,238,678; on concrete roads, $18,172,084; on earth roads, $6,645,245, and on all others combined (these including sand-clay, macadam, macadam with mat top, bituminous macadam, bituminous concrete, brick, and miscellaneous), $14,720,460.

With such a large proportion of the country depending upon gravel roads and with such large sums spent in their construction, it would seem desirable that more attention be given to this class of road by engineers and other road experts. Probably ten times as much has been done in the way of experimenting and has been written by engineers concerning bituminous concrete roads as concerning gravel, and yet nearly four times as much money was spent during the three years named on gravel as on bituminous concrete.

We expect to publish next week some ideas of specialists on gravel roads and hope that the present indications that a more serious interest in gravel roads is being taken by highway engineers will be borne out by later development.

Refuse Utilization Difficulties

Within a very few weeks reports have come of two companies holding contracts for the disposal of municipal refuse having abandoned these contracts because of the inability, or at least the failure, of the municipal authorities to secure a satisfactory separation of the refuse, especially of solid rubbish from the garbage. Each of these companies has stated that the presence in the garbage of bottles and pieces of metal, stones and other hard objects has resulted in a breaking of the machinery through which the garbage is passed and that unless the city authorities can induce the citizens to keep the garbage free from such objects it will be impracticable for these companies to carry out their processes.

It does not appear whether the citizens of Boston and of Atlantic City are more difficult to control in this matter of garbage separation than those of other cities or whether the utilization processes and machinery used is different from that used by the several cities which have for years been disposing of garbage by utilization processes of one kind or another. These two instances, however, would seem to point to one of the difficulties in the utilization of municipal refuse, this being the necessity of securing a more

or less complete separation of the refuse into at least two, and even three or four, different classes.

In the case of incineration this necessity of separation would not appear to be so great, although even for that method of disposal it is generally desirable to separate out from the combustible matter that which is incombustible and only clogs or smothers the fire, such as fine ashes and dirt, watermelon rinds, corn cobs and certain other materials. As long as there are careless and thoughtless people there will be difficulty in securing this separation, even after the citizens generally have been convinced of its desirability. And yet certain cities have been fortunate enough to obtain officials who have appeared to be quite successful in this respect. For instance, Minneapolis and Trenton taught their citizens to drain their garbage and wrap it in paper before depositing it in the pails, and we believe that in a comparatively short time the citizens observed this regulation quite generally.

This is one of the many problems arising to complicate the question of what method of disposal of refuse will be best for any given city. This question of refuse disposal is by no means an easy one to settle, and, in fact, there appear to be few cities where it has been settled satisfactorily to all concerned, if we include among these the residents in the vicinity of the place of disposal, whether this be a dump, a utilization plant or an incinerator; including also the taxpayers who have to pay the construction and operating expenses and the householders who have to purchase and keep on hand one, two or three receptacles required and perform the necessary separation of the refuse deposited in them.

Poor Back Filling Costs $7,500

In Waltham, Mass., there was constructed in 1881 a storm sewer 36 inches in diameter, constructed of a single course of brick laid in natural cement, which lies at one point 18 feet below the surface of the roadway. About eleven years later a trunk sewer was laid in the same street 20 feet below the surface and 5 or 6 feet away from the storm sewer. In spite of the danger which this threatened to the storm sewer, especially in view of its light construction, it would appear that the back-filling around the trunk sewer was not made as thoroughly and compactly as it should have been, for the back filling continued to settle slightly year by year, permitting the ground between it and the storm sewer to fall away from the latter, which finally cracked on the underside toward the trunk sewer and finally, in 1919, settled and collapsed for a distance of over 100 feet and was badly cracked for another 100 feet. About 1906 an 8-inch water main had been laid in the same street about 5 feet deep and crossing diagonally over the storm sewer for a distance of about 140 feet. When the storm sewer collapsed the earth between it and the water main above settled, the water main broke in two and the rush of water from it added considerably to the damage done by the break in the sewer.

The work of repairing the storm sewer and water main required two months of time and an expenditure of $7,490, and seriously interfered with carrying out the city's program for general repair work on the streets, since a large part of the labor used would otherwise have been employed on street work. The excavation was handled with a Carson trench machine, as the limited number of men available, the unusual depth of the trench and the loose gravel soil made hand-digging impracticable. Of the total cost, $4,519 was for labor, $2,311 was for material, and most of the remainder was for teams and trucks and machine hire, the last being $336.

Construction Costs in the Philippines

In a letter dated Manila, P. I., August 26, A. G. Hillberg, civil and hydraulic engineer, formerly of New York City, writes:

"You mention about the bad conditions in the United States and the difficulty of making both ends meet on the salaried positions. The same conditions exist out here because labor and materials ran up tremendously during the past two or three years. It does not look as if the cost of materials would be any lower for the coming four or five years, but labor may come down somewhat.

"However, the costs of construction labor in the Philippines is not excessive as compared with labor in America. The Filippino laborer is not as efficient as the laborer we employ in the States, but he is only paid from 75 cents to $1, gold, a day, consequently even if he is 40 or 50 per cent efficient as compared with labor in America, the labor costs are still less than half of what they are in the States.

"Costs of materials, however, are almost double of what they are in the States and this brings about the curious conditions that in construction work materials cost about 75 per cent and labor 25 per cent. In the States it is almost the reverse, viz.: materials 25 per cent and labor 75 per cent."

Highway Detours

In a discussion at a meeting of the executive committee of the League of Improvement Societies at Providence, R. I., on September 22, the practices followed in respect to detours around sections of highway under construction were condemned. Among other things, it was the general opinion that before any section of road was torn up by contractors for making repairs or reconstructing, the detours necessary should be placed in a passable condition. Many accidents and much expense from breakage of automobiles had resulted from the poor condition of detours during the past summer. The committee also expressed the opinion that contracts for repairing state highways should contain provisions that shorter stretches of road be torn up during repairs, the present practice of tearing up the whole road resulting in unnecessary inconvenience to motorists and traffic generally.

The National Construction Situation

Data furnished by Associated General Contractors in all parts of the country covering fundamental causes of present conditions, and recommendations for Government Action

The Associated General Contractors have recently made to the Honorable William A. Calder, chairman of the Senate Committee on Reconstruction and Production, a statement regarding the present situation of engineering construction and housing in the United States, accompanied by recommendations for action that, in their opinion, will most quickly and efficiently relieve the present serious conditions.

By a questionnaire directed to its members and others, the association has received widespread and competent information regarding the existence and amount of abnormal construction conditions, the efforts that have been made to remedy them and suggestions for future action.

From a summary of these it is concluded that there exists a housing shortage of about $1,500,000,000; that the Federal highway program for 1920 amounting to $633,000,000 and a very large amount of other highway work has completely fallen through, and that railroad work, waterpower developments, vast reclamation projects, harbor and river improvements and other public works are at a standstill.

FUNDAMENTAL CAUSES

Cessation of normal construction during the war is assumed to be the principal cause of the present shortage of construction facilities. The immediate problem faced, however, is the inability of construction industry to function efficiently at the present time. This is due to inadequate transportation facilities, restricted finance, high cost of materials, labor and strikes.

Transportation priorities granted to fuel caused a complete suspension of work on most projects requiring a large amount of bulky materials, especially east of the Mississippi river, which was aggravated by lack of cars and lack of ability to move them. If construction were to begin again with all its facilities, the same difficulties that existed early in the summer would at once reappear in large measure.

RECOMMENDATIONS

It is therefore recommended to the Interstate Commerce Commission that priority of transportation next to food and fuel should be given to materials for essential construction. Government aid should be extended to the effort of the Association of Railway Executives to reduce the standing time of freight cars. Reciprocal demurrage, based on a money consideration should be established. For individual loans to railroads there should be substituted the establishment of a National Trust, guaranteed by the Government, to purchase cars for the relief of all railroads and allot them to various lines to be paid for in ten years or less.

It was recommended that the Federal Reserve Board adopt a more liberal policy towards construction loans. This can be done by:

1. The rediscounting by Federal Reserve Banks of the notes of building and loan associations at lower rates.
2. The extension of more liberal credits to essential industrial extension projects.
3. The encouragement of the production of essential commodities and necessities through preferential discount rates.
4. A modification of income and excess profit taxes and the adoption of a direct commodity tax, especially on luxuries. Other features apply especially to the housing problem.

Prices of material are believed to be higher than are warranted, and the expectation of future increase restrains the investment of capital. It is, therefore, recommended that:

1. Retail prices, production, distribution cost and selling prices and manufacturers' prices and their relations should be investigated and fully published.
2. The Federal government should provide regular dissemination of information regarding current production and market prices of construction material.

LABOR

The high cost of labor is attributable to inefficiency and shortage. In some cities efficiency has been increased by curtailment of work and open-shop policy. The labor supply has been inadequate for several years and can only be increased by immigration. There is a great scarcity of skilled mechanics and efficient trained workmen. Shortage is aggravated by idleness due to strikes, lockouts and lack of co-operation between employers and employees. The provision of judicial tribunals for industrial disputes, with authority to enforce their decisions is incumbent on the government.

The remedies suggested include:

1. The immediate encouragement of immigration and its supervision.
2. Extensive government aid to trade schools, to train apprentices in a range of related subjects wide enough to enable them to adapt themselves to changes of industrial conditions and reasonable demands.
3. A system of government courts to handle industrial disputes with power to enforce their awards.
4. Government encouragement to a national conference of construction employers, employees and other related interests.

Southern Pine Production

The Monthly Trade Barometer for August of the Southern Pine Association, representing 204 subscribers in the states of Louisiana, Alabama, Oklahoma, Texas, Arkansas, Mississippi, Florida and George, shows that the combined cut for August was 383,539,945 feet while the stocks on

hand August 31 were 1,355,979,024 feet. The August shipments were 88.04 per cent and the demand 84.95 per cent of production, the stocks on hand being increased 45,862,846 feet or 3.5 per cent. The production for the month was 75.87 per cent and the orders were 64.45 per cent of normal. On August 31 the stocks on hand were 509,665,407 feet or 62.28 per cent more than August 31, 1919. The total exports during August through southern ports were 57,822,876 feet.

Seattle 's Municipal Street Railway Loses Money

That Seattle's municipal street railway system is being operated at an average daily loss of $3,-213.76 despite the increase in rate of fare recently put into effect became known in connection with a report by C. L. Hammons, statistician of the street railway department.

During the period from July 24 to August 23, inclusive, the first month of the 6¼-cent fare, the actual fare receipts were $496,034.35, according to this report. This gives an average daily revenue from fares of $16,001.10, which is increased to $16,447.94 by the addition of daily average receipts from miscellaneous sources of $447.94.

Daily operating costs, based on the July report, Mr. Hammons states, were $13,100.50; daily interest charge $2,404.60; daily depreciation charge $1,880.52; making the total daily cost of the railway $17,385.62. Subtracting from this amount the average daily revenue of $16,449.04, Mr. Hammons finds the daily deficit to be $936.58, to which he adds $2,282.18 as the daily average amount to be set aside for the redemption of outstanding bonds, which brings the total daily deficit under present operating conditions to $3,-218.76.

Mr. Hammons includes in his report a comparison showing $496,034.35 as the actual revenue for fare receipts during the month from July 24 to August 23 and $388,972.63 as the amount that would have been received had the same number of passengers been carried on the old rate of fare, 5 cents. From this he claims a revenue increase of $107,061.72 for the month. City officials declare this increase is only apparent in part, as Mr. Hammon's own figures on the number of passengers carried show that the total for the month of August, with the 6¼-cent fare in effect, was 6 per cent less than that of the previous month when the 5-cent fare prevailed.

Electric Light and Power Stations

Figures just published by the United States Census Bureau for the year 1917 show that there were nearly twice as many commercial stations as municipal, with 23 times as much value of plant, 24 times as much output of current, 12 times as much income. Data by geographical sections are given in the summary

The Bureau of the Census has just published a report on central electric light and power stations, the figures and other data being for the year of 1917. Although these figures are now nearly three years old, the condition of the country has been such during those three years that they are probably more nearly applicable to present conditions than a three-year-old report would have been at any other time during the past twenty-five years. The tables give figures separately for commercial and municipal central electric stations, each arranged by geographical divisions.

The value of plant and equipment of the commercial stations was $2,933,016,941, while that of municipal stations was $127,375,200, or less than one-twentieth as great. Comparing the total assets, the difference is even greater, these being $3,631,973,213 and $148,345,165, respectively. There were 4,224 commercial stations and 2,318 municipal stations, showing that the average commercial station was about ten times the size of the average municipal.

Comparing the incomes, we find the total income by the commercial stations was $486,634,-021, and that of the municipal stations was $40,-260,219. The general ratio between total incomes is approximately the same as that between returns from sale of light and heat, power, and municipal street lighting, respectively, but the municipal stations sold electric energy to other public service corporations to the amount of $317,-326, while this item for the commercial stations was $57,207,466. On the other hand, the commercial stations furnished free service estimated at $524,820, while the municipal stations furnished free service estimated at $5,095,843.

In matter of equipment, the commercial stations operated 10,387 units with a total horsepower of 12,077,657, while municipal stations operated 3,408 units with a total horsepower of 859,-098. Of the total units in the commercial plants, about 51 per cent were steam, while in the municipal plants 65 per cent were steam. In the commercial plants 30 per cent were water-wheels and turbines and in the municipal plants about 7 per cent, while about 19 per cent of the commercial units were internal combustion engines and 28 per cent of the municipal units.

During the year the commercial stations had an output of 24,398,983,183 kw. h., while the municipal stations had an output of 1,039,320,089 kw. h.

Comparing the number of street lamps to which current was furnished, the commercial stations operated 206,957 arcs and the municipal stations 49,993. Of incandescents, the commercial stations operated 962,908 and the municipal 420,311. The commercial stations served 6,202,189 customers and the municipal stations 976,514 customers.

NUMBERS AND CAPACITIES BY SECTIONS

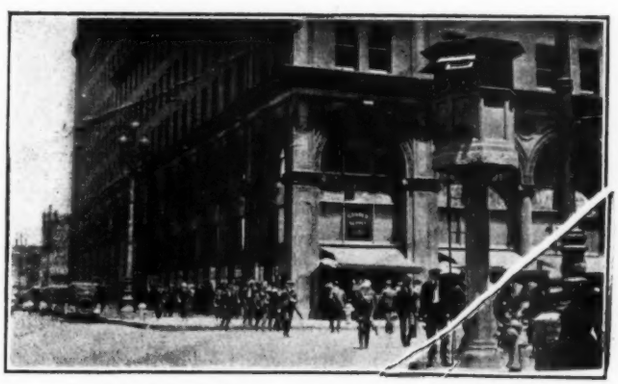
The number of commercial stations was 4.3 times as many as the municipal in New England, 4.5 times as many in the Middle Atlantic states, 1.4 in the East North Central, 1.3 in the West North Central, 1.2 in the South Atlantic, 1.7 in the East South Central, 2.3 in the West South Central, 3.6 in the Mountains and 4.3 in the Pacific states. In a few states the number of municipal stations exceeded the commercial, Minnesota having 133 municipal and 122 commercial, Nebraska 149 municipal and 140 commercial, Kansas 186 municipal and 116 commercial, North Carolina 80 municipal and 79 commercial, Georgia 128 municipal and 48 commercial, Oklahoma 106 municipal and 95 commercial. When it comes to a comparison of the capacity of the stations, however, the figures are very much more favorable to the commercial plants. The 133 stations in Minnesota, for instance, have only 31,655 horsepower in their primary power plants as against 196,584 horsepower in the 12 commercial plants. In output of stations there is nothing like approximate equality between commercial and municipal stations in any state except those of Florida and Washington, the municipal output in the former having been 23,119,667 kw. h. as against 27,768,325 for the commercial stations, while in the state of Washington the output of the fourteen municipal stations was 123,487,135 kw. h. and that of the seventy-four commercial stations was 118,883,821. In the latter state the commercial stations used steam for their primary power to a total of 21,770 h. p., while the municipal plants generate only 14,500 h. p. by steam, this being developed by two steam turbines. In the municipal plants, waterpower is used for the remaining 57,340 h. p., while in the commercial stations water-power is used for 56,828 h. p., and internal combustion engines for 600 h. p.

In the ten years, between 1907 and 1917, the commercial stations increased 22 per cent in number and 201.1 per cent in gross income, while the municipal plants increased 85.1 per cent in number and 187.3 per cent in gross income. In other words, the rate of increase in the revenues of commercial plants has been more than nine times as rapid as the growth in the number of stations, while for municipal plants it has been little more than twice as rapid. The gross incomes in 1917 totaled $40,260,219 for the municipal plants and $486,634,021 for the commercial.

Comparing the rates charged, the averages for the entire United States for lighting were 5.6 cents per kw. h. by commercial and 4.9 cents by municipal, while for power the rates were 1.2 by commercial plants and 1.8 by municipal. The relation between rates was by no means uniform in the different sections of the country, the commercial rates for lighting being higher in some sections and lower in the others. For instance, the lighting rates by commercial plants averaged higher in New England, the East North Central, Mountain and Pacific States, but averaged lower in the other sections of the country. For power, however, the rates charged by commercial plants were lower in every one of the geographical divisions, although being higher in some of the individual states, as in Vermont, Illinois and Kentucky. The lowest state average rate for power was in Montana, 0.6 cent, while the highest average rates were 30.9 cents (municipal) in Wyoming and 6.5 cents (municipal) in New Hampshire. The highest lighting rates were found in Rhode Island, 13.1 cents (municipal), South Dakota, 12.0 (municipal), New Mexico, 11.7 cents (municipal); the highest commercial state rate being 10.7 in New Mexico. The lowest lighting rates were reported by California, 1.9 (municipal), Illinois, 2.4 cents (municipal), and West Virginia, 3 cents (commercial). In individual instances much higher rates are found than these averages, some small plants charging as high at 25 cents.

Traffic Tower for San Francisco

The tower shown in the accompanying photograph was recently completed at the corner of Market and Spear streets, San Francisco. It was designed to control an electrically operated switch for diverting certain cars of the United Railroads



STREET TRAFFIC TOWER IN SAN FRANCISCO

from the inner track to the Municipal or outer track. The switch is located at the lower left-hand corner of the illustration.

Overloading Motor Trucks

Before a conference of county commissioners not long ago, Louis S. Sadler, state highway commissioner of Pennsylvania, stated that the highways of that state were being ruined by a clique of greedy men who were overloading their motor trucks, and that such overloading must stop. Said he: "Under existing laws, all we can do to a man who overloads a truck is to have him fined $100. Such men should be sent to jail, and unless some drastic action is taken by the next legislature, the entire road system of Pennsylvania, or at least those portions of it near the larger cities, will be in utter ruin."

Engineering College of University of Maryland

A. N. Johnson has been appointed Dean of the Engineering College of the University of Maryland as a first step in the reorganization of this college. An arrangement has been made with the State Roads Commission and the Bureau of Public Roads whereby an engineering experiment station will be established at and run in connection with the engineering college.

Mr. Johnson assumed his duties on October 1. On graduating from Harvard, he spent four years as a member of its faculty. In 1897 he became member of the National Highway Commission. From 1988 to 1904 he was State Highway Engineer of the U. S. Office of Public Roads; 1906 to 1914 State Highway Engineer of Illinois; in 1915 highway engineer of the Bureau of Municipal Research, New York; and since 1916 has been consulting highway engineer of the Portland Cement Association.

Mr. Johnson will be given a free hand in the development of engineering at the University of Maryland. Special emphasis will be placed on general civil engineering and highway engineering, while broad development of electrical engineering work along lines of electrical communication is intended. Mr. Johnson's title will be Dean of the College of Engineering and Director of the Engineering Experiment Station.

Dr. Samuel Sheldon

Dr. Samuel Sheldon, past-president of the American Institute of Electrical Engineers and professor of physics at the Polytechnic Institute of Brooklyn, died September 4, at Middlebury, Vt. After graduation from Middlebury College, Dr. Sheldon studied two years in Germany, receiving there the degree of Doctor of Philosophy and later from the University of Pennsylvania the honorary degree of Doctor of Science. During his connection of thirty-one years with the Polytechnic Institute of Brooklyn, Dr. Sheldon instructed over a thousand graduates, some of them having become famous in electrical engineering.

Dr. Sheldon was the author of several college text books, monograms and papers on special topics and for thirty years was a member of the American Institute of Electrical Engineers, serving in various official capacities. He was also a member of the Interurban State Railway Association and of several technical societies.

Hard Surface Roads for North Carolina

The North Carolina Good Roads Association is apparently bringing about in that state a sentiment for the construction of hard-surface roads as soon and as rapidly as finances and circumstances will permit. It reports that the people in all sections of the state are opposed to further waste of money on make-shift types of roads, such as sand-clay or top soil. During the recent rainy season the entire western part of the state found its roads almost impassable.

The Old Niagara Railroad Suspension Bridge

Reminscences of its maintenance and successive reconstructions.

In the discussion which followed the recent presentation to the American Society of Civil Engineers of a paper by C. E. Fowler on the railroad steel arch bridge over the Niagara river at Suspension Bridge, New York, some interesting reminiscences were presented of the suspension bridge which was replaced by the steel arch.

This famous structure, built by John A. Roebling in 1895, had a single track railroad on the upper deck and a highway and sidewalk on the lower deck and was the first long-span railroad suspension bridge. It had a span of 800 feet, stone towers 80 feet high, straight iron wire main cables, stiffening trusses with wooden struts and vertical braces and wrought-iron diagonal rods. The beams and stringers and both floors were of wood.

About twenty years after the bridge was built, there was reason to suspect the integrity of the main cables at the anchorages; and the late L. L. Buck exposed the old anchorages, discovered the corrosion of the wires near where they engaged the anchor pins, and so clamped the main cables as to take the stress under traffic of the vehicles and trains then crossing the bridge, and spliced new wires in the anchorages, without any material interruption of the traffic.

A few years later, Mr. Buck, whose great abilities were thoroughly appreciated by the bridge owners, was retained regularly as consulting engineer and decided that the old stiffening trusses had become inadequate for the increasing traffic, under which they deflected two or three feet.

REMOVING SUSPENDED STRUCTURE UNDER TRAFFIC

Mr. Buck undertook the then unprecedented task of replacing the wooden trusses with steel under traffic without interrupting either railway or highway service on the upper and lower decks of the bridge. He designed Hay steel trusses of the same dimensions as the wooden trusses; this being one of the very first applications of steel to structural work.

It was before the days of steam power or special plant of any kind in bridge erection and the erection was done entirely by hand, and done well and cheaply, although without hoisting engines, pneumatic tools or electricity.

Wrought-iron highway bridges were only just coming into use; the engineer had an unknown problem, and nothing to work with, yet he solved it successfully. Every portion of the old trusses was removed; the suspender cables were adjusted; the stresses in them were measured; the new trusses were heavily cambered and put in

service, all in one season, and without a serious accident of any description.

In the erection force of about 200 men, not one of them except the superintendent would pass for any kind of a bridge man today, or at any time within the last 20 years. There were only two of the men that came from the bridge shops that had any knowledge whatever of bridges; the other men were picked up on the spot.

It is an interesting fact that about 40 per cent of the men commenced work with a confidential request that they be allowed to work on the United States side of the bridge, because of little irregularities in their private lives that made it embarrassing for them to work on the Canada side; and another 40 per cent of the men made the same request, reversing the sides. They were a hard-bitted crew, but on account perhaps of their little eccentricities, they were very bright, and many of them became expert. They included all sorts of mechanics, especially a lot of very poor carpenters, who had to cut out the old wooden trusses as the new ones were put in, and they never did it right; the hundredth time they did it, it was not done right. They could not cut to a templet. The old chords were cut out a piece at a time, and clamped to the new steel chords.

The pieces were all small and all handled by hand. The rivets, among the first steel bridge rivets, were driven by hand and gave some trouble reheating and finishing. For replacing the highway floor, there was used a short, portable elevated bridge, on rollers, which carried the traffic to and from it by a ramp at each end, while the old floor underneath was cut out and the new I-beams, diagonal rods and deck were assembled in its place. The men had to crawl on the old floor beams, 240 feet above the rapids, and insert those lateral rods, and there were only two men who would do that work.

The stresses in the suspender ropes were measured with a dynamometer. Very little difficulty was encountered in getting the stresses perfectly uniform. After the operator had become skilled in the adjustments, by tapping the suspender ropes with a hammer, or even by grasping by the hand, he could tell within a few pounds whether the stresses were uniform or not.

Great numbers of tools were carelessly dropped from the bridge. The river channel under it is only about 400 feet wide. That left a strip of 200 feet of pretty rocky territory on each side of the river, where the men dropped hundreds of dollars worth of tools from the bridge. So many fell on the land that it was finally made a practice to shut off work for half an hour or an hour on Saturday on one end or other of the bridge, and send a man down with a bag to recover the tools. He would bring back a load of big monkey wrenches and all sorts of tools.

RECKLESS BRAVADO

There were some pretty reckless fellows on the bridge, and two or three developed a good deal of rivalry. One of them dropped a valuable tool that fell on the rocks; he did not want to be held accountable for the loss of that tool. He did not like to report it. He did not want to go off the bridge and have it noted at the office that he went. So what did the idiot do but select, about 300 feet from one end of the bridge, a guy rope that ran from the lower chord of the bridge, diagonally up stream and down to a point on the shore some 400 feet away and 240 feet below, near the water's edge.

He climbed out, hung from the guy rope, and started down hand over hand, to make that perilous trip to the water's edge. His dearest foe seeing him safely started, and not to be outdone, went to the very longest guy rope, next beyond, and started down in a race. The assistant engineer got to the scene of activities just too late. It was humanly impossible for them to get back again, and they were already beginning to lose their nerve. He had an inspiration, and treated those men to a blistering calling down that was a combination of drill practice, football coaching, Pittsburgh shop abuse, and personal scarification intended to divert their attention from their great peril. He threatened to fire and fine the loser of the race and cursed them so roundly that instinctively they paid more attention to him than they did to their own danger.

As they went down their strength flagged; one fellow succeeded in getting within 10 or 15 feet of the ground, let go and dropped, fortunately fell into the top of a tree and did not get much hurt. Both were discharged, and next week taken on again.

PATCHING MASONRY TOWERS

A number of years after the trusses were renewed, Mr. Buck observed that the tops of the old towers were in very bad condition. The saddles on which the old cables rested there had become rusted solidly in place, and the temperature expansion and contraction of the cables caused the tops of those rigid masonry towers 80 feet high to deflect several inches. So Mr. Buck removed the damaged stones from the faces of the towers, and inserted new stones from the Chaumont quarries. He did a beautiful job in a wonderful way that gave the towers another short lease of life.

Finally, however, the towers got too bad for further patching. Then Mr. Buck built steel towers and suspended the main cable saddles from them by lashings of high tension wires rove under or through their bases.

This released the old masonry and still maintained railway traffic while workmen cut off the tops of the old masonry towers, put in the girders in the permanent steel towers, and reseated the saddles with their cables on them, after which they removed the old masonry towers and completed the interior bracing of the steel towers.

The bridge then stood for a number of years until Mr. Buck had the opportunity and the glory of rebuilding it, which had long been his ambition. His first plan was to build a cantilever across the gorge, and he was probably disap-

pointed when C. C. Schneider built the Niagara cantilever, although he could not but recognize that the cliff formation there was adapted to the arch type of construction which he eventually built.

CANTILEVER ERECTION OF ARCH SPAN

The method of construction of the arch in the field was very interesting. It was carried out by R. S. Buck, who was L. L. Buck's exceedingly capable associate on the work. The arch was erected on the cantilever principle, the two ends being constructed simultaneously, with the tops of the vertical end posts guyed back to the anchorages. The material was handled by light travellers that moved on the deck of the old structure and delivered the members to the trusses under erection.

The arch structure, although carrying the railroad and highway at the same alignment and elevation, was proportioned to clear and enclosed like a trough, during its erection, the suspension bridge, which continued in service during the entire operation of constructing the arch bridge, while both arms were being built out on each side of the river, until as curved cantilevers they joined in the middle, and were made complete and self-supporting, and the suspended span was removed.

One of the most interesting pictures in a very extensive collection of photographs covering most of the history of bridge erection, is an historic one showing the bridge just before completion of that arch, the Schneider cantilever in the background, the suspension bridge still intact, and the arch bridge nearly completed, and partly enclosing the suspension bridge. With the completion of that arch Mr. Buck finished an important chapter of the historic Niagara bridge, and achieved great credit for himself and the engineering profession.

Labor Notes

Director U. S. Employment Service says: "Coming winter will be one of the best in years as regards opportunities for employment, with the exception of the war years, when there was an absolute general shortage of labor."

About 1,200 Spaniards from Europe are employed as unskilled labor by the Pennsylvania Railroad.

Pennsylvania State Employment Bureau reports a shortage of 25,000 workers in Pittsburgh district; men are also needed, the report says, in the bituminous coal fields to take places of miners who have not returned to work; a shortage of farm labor is noted in many sections of the state.

Wage rate of sheet steel mill operatives who are parties to Amalgamated Association of Iron, Steel and Tin Workers was reduced 1½ per cent on the base wage for September-October period; wages are based on prices of sheet steel and reflects lowered prices; July-August bi-monthly adjustment was highest in history of industry, being 108 per cent above base; September-October rate is 106½ per cent above base.

The Cost of Immigration

In a weekly letter to the members of the Inter-Racial Council, President William H. Barr called attention to the rapidly increasing arrival of aliens in this country and the prospect for an enormous influx of them following the seven years of reduced immigration and stimulated by the desire of million who wish to emigrate from Europe.

He considers that immigration will be subjected unavoidably to three obstructions, namely, the increased cost of transportation, the literacy test and limited transportation facilities. The cost of passage tickets has more than doubled. The head tax which, in 1882 was 50 cents, is now $8, and every immigrant has to pay $10 for the American Consul's vise; besides which there is a much greater difficulty in the unfavorable rate of exchange as compared with 1913, when American dollars were at par and passage rates varied from $34 from Hamburg to $48.50 from Patros as against $125 for both places, and a minimum of $98 from Genoa for all of the six ports mentioned. These differences are very much increased by the vastly larger present value of the dollar which, when translated to equivalents in foreign coins, shows an increase of more than 700 per cent on cost of tickets from Trieste to New York. Although the immigrants now earn higher wages in Europe than in 1913, the purchasing value is reduced, and increased embarkation and traveling expenses there and consular fees for each country passed through are so great that the immigrant must be already in a prosperous condition or be assisted in order to come to this country.

The literacy test was required with the expectation that it would reduce immigration, which it undoubtedly will accomplish; although many immigrants can meet it, there are undoubtedly many whom it will debar.

It has been estimated that existing shipping facilities will limit the immigration during the year commencing last April to 750,000. Although current data do not give much information regarding classification of immigrants and such information does not appear until it is quite old, the Inter-Racial Council estimates that three-fifths of the incoming, and two-thirds of the outgoing, aliens are men, which is probably a liberal proportion. From analyses of records for June, July and August, it is estimated that the net number of immigrant males was approximately 1,575 per week, amounting to only about 80,000 per year. The significance of these figures is seriously affected by the number of male aliens leaving this country, most of whom have much greater experience and earning capacity than the incoming aliens.

Recent Legal Decisions

RESERVOIR EXCAVATION HELD CHARGEABLE AS SHALLOW FLOWAGE EXCAVATION

A contract for the excavation of a reservoir provided the sum of 35 cents for the removal of the top soil, $1.48 per cubic yard for miscellaneous excavation, and 24 cents per yard for shallow flowage excavation. The New York Appellate Division holds, in an action for work done, Beaver Engineering & Contracting Co. v. City of New York, 183 N. Y. Supp. 386, that, in view of other provisions of the contract, excavation of material for treatment of the reservoir bottom should be paid for as shallow flowage excavation at the rate of 24 cents per cubic yard, particularly as previous settlements had been made on that basis and for the further reason that another construction would give the contractor much greater compensation for excavation for this purpose than excavation for material for dikes involving greater labor, which was treated as shallow flowage.

CONTRACTOR CANNOT CLAIM PAYMENT FOR UNAUTHORIZED WORK ON BRIDGE EXCEPT THROUGH LEGISLATURE

The New York Appellate Division holds, Paddleford v. State, 183 N. Y. Supp. 249, that under the State Highway Law, §2, Subd. 5, defining highways as including bridges having spans of 5 feet or less, there is no authority of any officer, board or department outside the Legislature that can audit or make payment to a contractor for the construction and improvement of a county highway who, by supplemental contract with the state commission of highways, built a 56-foot bridge over a body of water. It was not questioned that supplemental contracts can be made for additional work and material by the state commission of highways and by the division engineer representing the department; but such contract must be to supplement and for additions upon contracts which come under the jurisdiction of the highway department, such as additional stone, material, or excavation, etc., on work being done on highways defined as such by the statute. The limit here is a 5 foot bridge; there is no authority to increase that length to 56 feet and still have it within the statute. The court said: "This statute is not ambiguous. Much as it is borne in upon us that these claimants are entitled to this amount of money from the state of New York, we cannot disregard an express provision of statute to reach that end, without bringing the administration of the law into disrepute. Claimants' relief is via the Legislature."

CITY NOT BOUND BY BUILDING COMMITTEE CHAIRMAN'S UNAUTHORIZED ORDER FOR MATERIAL

The New Jersey Supreme Court, in McLean v. Mayor & Common Council of Newark, 110 Atl. 692, holds that the city of Newark is not liable for materials furnished and labor performed, or orders issued by the chairman of the public building committee of the common council of the city, where the orders were not authorized by the city nor by the committee of which he was chairman, and the common council did not ratify the chairman's action, and had not paid any similar orders. The case was held to fall within the rule laid down in other New Jersey cases, that a municipal corporation cannot be held bound, by either an express or an implied contract, in defiance of express restrictions imposed by law, as limitations on the powers of the corporate agents, through whose instrumentality the contract is sought to be derived.

AIMING TO PREVENT REMOVAL OF COUNTY SEAT HELD UNENFORCEABLE

A contractor had agreed with county commissioners for the rebuilding of a courthouse at the county seat. The legality of the contract was disputed by taxpayers and injunction proceedings were threatened. There was also a movement to remove the county seat to another town. To induce the contractor to continue the work of rebuilding, a contract was entered into with him by certain residents of the county seat to reimburse him for any loss he should sustain in his further prosecution of the work, this contract being entered into in order to rebuild the courthouse before removal of the county seat, and thus create a situation which would influence public sentiment against the change. In an action by the contractor who, relying upon this contract, had incurred certain obligations, it was held, King v. Randall, Nevada Supreme Court, 190 Pac. 979, that the contract was unenforceable as contrary to public policy.

STATUTORY BOND PROVISION AS TO SUPPLIES TO CONTRACTOR

A bond given by a schoolhouse construction contractor, which contains no clause for the payment for supplies furnished, is not the bond required by the Texas statute of 1914 with reference to public buildings, and while it may be good as a common law bond, does not bind the surety further than therein specifically stated, and therefore, the Texas Court of Civil Appeals holds, Acme Brick Co. v. Taylor, 223 S. W. 248, does not make the surety liable for supplies furnished the contractor. The contractor, however, may be sued for such supplies.

ROAD BOND STATUTE MODIFIED BY LATER ACT

Mississippi Laws, 1914, c. 176, provides a scheme for the issuance of bonds for road purposes and for working roads. Under this act a bond issue was authorized, but bonds were not actually issued when Laws, 1920, c. 207, was passed. The two acts were in conflict with respect to the method of ordering elections, and the Mississippi Supreme Court holds, Rosenstock v. Board of Supervisors of Washington County, 85 So. 91, that the latter act prevails over the former as to method, but does not avoid an election under the former, but only limits the time to one year after the passage of the later act.

NEWS OF THE SOCIETIES

October 16-19—AMERICAN COUNTRY LIFE ASSOCIATION. Annual conference, Springfield, Mass. President. Kenyon, L. Butterfield, Amherst, Mass.

Oct. 19—CORNELL SOCIETY OF CIVIL ENGINEERS. Annual meeting. New York City.

Oct. 19-22—INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. 25th annual convention, New Orleans, La. Secretary, C. R. George, Houston, Texas.

Oct. 20 — AMERICAN WATERWORKS ASSOCIATION. New York Section. October meeting. New York City.

OCT. 26-28—AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION. Convention at tlanta, Ga. Headquarters, Chicago.

Nov. 5-6 — AMERICAN WATERWORKS ASSOCIATION. Iowa section. Sixth Annual Convention. Iowa City.

November 12—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Second Fall meeting, Chicago. Sec.. 33 W. 39th St., New York.

Nov. 12—CONFERENCE ON EMPLOYMENT AND EDUCATION, sponsored by the American Assn. of Engineers. Chicago.

Nov. 15-17—CITY MANAGERS, ASSOCIATION. Annual convention at Cincinnati, O. Executive Secretary, Harrison G. Otis, 812 Tribune Bldg., New York City.

Nov. 18-19 — AMERICAN ENGINEERING COUNCIL. Organization meeting. Washington, D. C.

Dec. 7-10—AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual meeting, New York. Secretary, 29 W. 39th St., New York City.

Jan. 25-27, 1921—THE AMERICAN WOOD PRESERVERS ASSOCIATION. Place of meeting to be announced later.

May 17-19, 1921—NATIONAL FIREMEN'S ASSOCIATION. Twenty-third annual convention. Fort Wayne, Ind.

June 7-9, 1921—NATIONAL FIRE PROTECTION ASSOCIATION. Annual meeting. San Francisco, Cal.

June, 1921 — CONFERENCE OF MAYORS AND OTHER CITY OFFICIALS, State of N. Y. 12th Annual Conference. Elmira, N. Y.

AMERICAN SOCIETY OF CIVIL ENGINEERS

At a business meeting of this society held at New York on September 1, there was an animated discussion of two important propositions now before the society—Joining the Federated American Enugineering Societies, and adopting the amendments to the constitution referred to the society by the annual convention in Portland last month. Of the nearly one hundred members present, the majority were opposed to both the amendments and joining the federation.

Joining the federation was opposed because it did not seem to promise any sufficient return to the society for the prestige which it would contribute and share with organizations of much lower standing, the federation did not have any definite program commensurate with its ambitious pretensions; and the finances of the society did not warrant its payment of the eight or ten thousand dollars a year called for, together with aditional sums which would probably be called for to make up deficits.

Concerning the amendments, it was objected that they conflicted with the constitution of the society, created an expensive machinery for the nomination of officers, would tend to create and perpetuate an oligarchy in the society, and that the annual conference of representatives of sections would involve a heavy expense. The amendment relating to dues was not objected to.

The meeting requested the Board of Directors to distribute to the corporate members, as soon as possible, the minutes of this meeting in order that they might have the benefits of the discussion in deciding how to vote upon these subjects.

AMERICAN ENGINEERING COUNCIL OF THE FEDERATED AMERICAN ENGINEERING SOCIETIES

The first meeting of the council will be held at Washington, D. C., November 18-19, 1920. Headquarters, New Willard Hotel.

At the first session there will be the appointment of temporary committees on Program, Credentials, Constitution and By-Laws, Nominations, Plan and Scope, Budget, and Resolutions.

At the second session there will be an address on Engineering Council by J. Parke Channing, chairman, and a discussion of the field of activity for the Federated American Engineering Societies.

On the second day there will be election of permanent officers, formal ratification of constitution and by-laws, reports of committees, an address by Herbert C. Hoover, president American Institute of Mining and Metallurgical Engineers, and an informal reception and smoker.

On Saturday, November 20, there will be an organization meeting of the executive board of the American Engineering Council of the Federated American Engineering Societies.

AMERICAN ASSOCIATION OF ENGINEERS

The Federal Department of the American Association of Engineers has announced the appointment of the following engineers as members of the Federal Department Council: Morris Bien, assistant director of the Reclamation Service, Washington; N. S. Thompson, chief of the electro-mechanical division, supervising architect's office, Washington; H. E. Hallborg, radio engineer, Norfolk Navy Yard, Norfolk, Va.; William B. Harrison, of the United States Engineers' office, Washington; W. C. Dean, chief of the electrical division, Bureau of Construction and Repair, Washington; W. A. E. Doying, inspecting engineer of the Panama Canal, Washington; W. C. Lemen, of the United States Engineers' office, New York; J. T. Maguire, project manager, Bureau of Yards and Docks, Washington, D. C.

It has been practically decided that the Chicago Chapter will assist in prosecuting the case of Messrs. Pihlfeldt, Young and Kushlan against officials of the city of Chicago. These three engineers, Thomas G. Pihlfeldt, city bridge engineer, Hugh Young and Max Kushlan, were dismissed from the employ of the city of Chicago as a result of a civil service trial which the chapter described in a public statement as "farcical." A suit has been instituted by the engineers to compel the city authorities to reinstate them. The Chicago Chapter has requested the national board of directors of A. A. E. to contribute $500 to the fund for this prosecution. At a recent meeting of the board of directors, this matter was referred to a committee consisting of Raymond Burnham, W. W. DeBerard and H. W. Clausen.

W. K. Eldridge of Indianapolis, in his discussion of the re-routing of street cars in Indianapolis before the Indianapolis Chapter of A. A. E. at the meeting on September 15, described the advantages of shuttle service on subsidiary lines. Mr. Eldridge declared that the public can be educated to the financial advantages of shuttle service as feeders to the main lines reaching the business section. Although such service would require passengers to transfer, the saving in operation would be considerable and it would be possible to actually improve the service on the main lines. The American Association of Engineers has opened offices in Boston at 50 Broomfield street, room 305. Fred C. Lewis is temporary managing secretary and also recording secretary.

Instructions have been received by Chairman Harold Almert of the A. A. E. building and insurance trustees from the board of directors of the association that the trustees, in making arrangements for the purchase of an A. A. E. building in Chicago to concentrate their efforts upon a building to cost about one million or one million and one-half dollars. Previous to this decision three types of buildings were under consideration; to cost three million, to cost one million or one and one-half million, and to cost one-half million.

The American Association of Engineers had 20,890 members in good standing on September 18.

306 men placed in one month is the record establishedd by the service department of the American Association of Engineers in August. Almost 3,000 men were referred to positions during the month.

At the first convention of the Washington State Assembly of A. A. E. held recently in Everett, Washington, a committee on education was appointed to arrange with state educational institutions for extension courses which can be taken advantage of by A. A. E. members in the state. The convention also recommended that county engineers of the state be appointed instead of elected, that they have full charge of road funds, and that their salaries range from $3,000 to $6,000 per annum.

The Northwestern Highway Section of A. A. E. and the Portland Press Club conducted a general excursion from Portland, Ore., to Carter Lake on Sept. 4, 5, and 6 in cooperation with the Oregon Bureau of Mines and Geology. The trip included a 45 mile auto drive around the rim of the lake. It was open to the public.

San Francisco Chapter of A. A. E. has engaged an executive secretary on a full time basis. An office is maintained in 960 Pacific Building, San Francisco.

Chapters of the American Association of Engineers in Arizona are preparing a license bill to be introduced in the next legislature.

Railroad sections of the American Association of Engineers have been notified of increases in salaries for engineering employees on the Union Pacific, the Burlington, The Kansas City Terminal, The Missouri-Kansas and Texas, the Great Western, the New York Central, the Boston and Maine, the Pennsylvania and several other railroads.

The New York Chapter has arranged to have as its guests at the United Engineers' Building, 29 West 39th street, New York, representatives of the National Headquarters of the Republican and Democratic parties in order for them to present to the association such points of their policy as they may choose, to provide a basis of opinion as to which party makes the strongest appeal from the standpoint of the engineer.

United States Senators Jos. T. Robinson of Arkansas and Jos. W. Wadsworth of New York will represent the Democratic and Republican parties, respectively.

The meeting is considered of such importance that provision has been made for it to be presided over by the heads of prominent engineering and allied societies, of whom thirty-three have been invited, including all of the great national societies, the local engineers' clubs, and others.

CORNELL ENGINEERING SOCIETY

At the annual meeting of the Cornell Society of Civil Engineers to be held in New York City, October 19, a motion will be made to change the name of the society to the Cornell Society of Engineers. This decision comes as the result of uniting all the engineering colleges at Cornell under one head. Previous to this, only graduates of the civil engineering college have been eligible for membership.

At this meeting, Dexter S. Kimball, the new dean of the combined engineering schools, will deliver an address, and Clifford M. Holland, chief engineer of the New York State Bridge and Tunnel Commission, will speak on the new Hudson River highway tunnel.

A JOINT ENGINEERS' MEETING

The New York Section of the Am. Inst. E. E., the Metropolitan Section of the Am. Soc. M. E. and the Railroad Section of the Am. Soc. M. E. will hold a joint meeting to discuss the relative merits of modern steam and electric locomotives on October 22, at the Engineering Societies Building, 20 West 39th street, New York City.

Papers will be presented by J. R. Muhlfeld, Railway and Industrial Engineers, Inc.; W. E. Woodard, vice-president, Lima Locomotive Works; A. H. Armstrong, chairman, electrification committee, General Electric Co., and F. H. Shepard, director of heavy traction, Westinghouse Electric & Mfg. Co.

SOUTHWEST WATERWORKS ASSOCIATION

At the Ninth Annual Convention of the Southwest Water Works Association, held in New Orleans, September 24, R. E. McDonnell, of the Burns & McDonnell Engineering Company, Kansas City, Mo., was elected president. Next year's annual convention will be in Oklahoma City.

ILLINOIS SOCIETY OFFERS PRIZES

The Illinois Society of Engineers has opened a competition for technical papers in the five divisions of drainage, roads and pavements, sewerage, surveying and miscellaneous civil engineering. The papers are to be from 1,500 to 2,500 words in length, a prize of $25 and a certificate of merit to be awarded to the best paper in each division.

AMERICAN ENGINEERING COUNCIL

The Council of the American Society of Mechanical Engineers has appointed the society's representatives on the American Engineering Council, the governing body of the newly created Federated American Engineering Societies. The delegates will represent the society at the organization meeting of the A. E. C., to be held at Washington, D. C., November 18 and 19.

THE WESTERN SOCIETY OF ENGINEERS

On October 20, this society will hold a joint meeting with the Chicago Section of the American Institute of Electrical Engineers for the annual lecture by Dr. Charles P. Steinmetz.

AMERICAN WATERWORKS ASSOCIATION NEW YORK SECTION

The October meeting of the American Water Works Association, New York Section, will be held on October 20, at the Hotel McAlpin, New York City. The meeting is scheduled to begin at 12 o'clock noon and at 1:30 Mr. George C. Whipple will give an illustrated talk on "Eight Months in Europe with the League of Red Cross Societies."

AMERICAN WATER WORKS ASSOCIATION

Iowa section of the American Water Works Association will hold its sixth annual convention in Iowa City, Iowa, on November 5th and 6th. This section includes the states of Wisconsin, Nebraska, Missouri, South Dakota and the state of Iowa. The name of the section will probably be changed at this meeting.

THE FEDERATED AMERICAN ENGINEERING SOCIETIES

The Federated American Engineering Societies announces the following associations have elected to become members: Engineering Association of Nashville, American Institute of Chemical Engineers, Engineering Society of Buffalo, American Institute of Mining and Metallurgical Engineers, Society of Industrial Engineers.

A.S.M.E. ORGANIZES MATERIALS HANDLING SECTION

Four hundred members of the American Society of Mechanical Engineers have organized themselves into a Professional Section on Materials Handling and will provide primarily a common channel of intercourse between all the technical and industrial organizations co-operating in the solution of engineering problems connected with the handling and distribution of materials and products.

This Section will aim to be a bureau of information, complete in its scope, specific in its knowledge of the physical and economic conditions and unbiased in its conclusions. This will be done by having special meetings on particular subjects, meetings jointly with other sections, other organizations or associations, by taking part in all local and national problems relating to the purpose of this Section.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

The fortieth anniversary of the founding of this society will be celebrated November 5 with exercises in forty-two cities, embracing all the leading industrial centers in the United States.

Through the co-operation of the United States army, speeches will be transmitted by radio-phone, so that those delivered in Boston, for example, will be heard in San Francisco.

The New York celebration will be held in the Engineering Societies' Building. Engineering achievements in peace and in war will be recounted and the meeting will be addressed through radio-phone. The principal speakers will include Fred J. Miller, president of the society; Herbert Hoover, president of the American Institute of Mining and Metallurgical Engineers; Arthur P. Davis, of Washington, D. C., chief engineer of the United States Reclamation Service, and Arthur W. Berresford, of Milwaukee, head of the American Institute of Electrical Engineers.

AMERICAN PUBLIC HEALTH ASSOCIATION

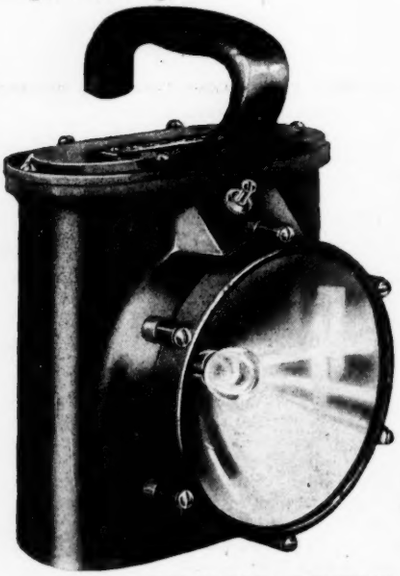
At the forty-ninth annual meeting, San Francisco, September 13-17, the principal subjects considered were Sanitation of Bathing Places, Industrial Waste Disposal and Garbage Disposal by Hog Feeding. A plan was favored for the co-ordination of Federal health activities and the eventual establishment of a Federal Department of Health with a representative in the Cabinet which was supported by H. S. Cummings, surgeon-general, U. S. Public Health Service. Officers elected were Dr. M. P. Ravenel, University of Missouri, president; Samuel A. Greeley, consulting engineer, Chicago, chairman, and Edward R. Rich, state sanitary engineer, Lansing, Mich., secretary.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

NEW LA FRANCE LANTERN ILLUSTRATED

The new LaFrance Lantern No. 1810 is waterproof and is absolutely safe to use around inflammable material of any kind. It is an ideal light for watchmen, firemen, sportsmen or automobilists. All metal parts are of brass and aluminum, accurately machined and nicely finished. The silvered reflector is large and designed to throw a wide working light with a strong, far-reaching beam for smoke, fog or long-distance work. A focussing device permits of changing the beam while the light is burning.



A SAFE, WATERPROOF ELECTRIC LANTERN

The light is controlled by a strong spring snap switch, conveniently located and positively spark-proof. The current is supplied by two standard dry cells, obtainable anywhere. This lantern will give months of intermittent service. The finish is regularly in red with black and polished brass trim, but furnished in other colors or polished aluminum if desired. A bracket for mounting is furnished at a slight extra cost. A plain bracket for the wall, truck or boat, and a special heavy brass bracket with a spring lock for fire apparatus. This lantern is manufactured by the American-LaFrance Fire Engine Company.

TROY TRAILERS

The 190 edition of the general catalog of the Troy Wagon Works Co. gives ilustrations, specifications and description of details of the standard trailers of 1, 2, 3, and 5-tons capacity having steel chassis and rubber tires. Without bodies they weigh from 900 to 4,295 pounds while the approximate weight of the bodies is from 400 to 1,800 pounds.

In their construction cast iron is eliminated and all parts are made of forged or cast steel, malleable iron or bronze. With one exception the different models are equipped with automobile type steer and drawbar which permits the truck to be attached at either end without necesitating the turning around of the trailer, a provision which is very valuable for backing and stopping the trailer.

They are equipped with automobile type knuckle axles and are steered through hinged yokes connected to the drawbars. The flexible frames, calculated to absorb shock and distortion strains, are mounted on springs shackled at both ends. The brakes, which can be placed on two or four wheels, are the expansion drum type operated by hand levers on the trailer bodies.

The one-piece I-beam axles are drop-forged and the artillery type wooden wheels have solid rubber tires with an 8,000 mile guarantee. The bearings are of high speed type. The drawbars are of telescopic construction containing powerful coil springs acting under compression whether the trailer is pulled or backed. The drawbars head provides a long spring bumper and facilitates backing.

For hauling two or more trailers in trains, they are connected by coupling links providing a universal angle adjustment for rough ground and irregularities. Bodies of various standard types are provided with flat platforms, stakes, racks, or dumping arrangements. The drop frame trailers are used with popular rolling side dump bodies operated rapidly and easily and are especially suited for hauling garbage, coal and city refuse and road-building materials.

KISSEL TRUCKS FOR ROAD BUILDING

A heavy-duty model Kissel truck will, it is claimed, haul an 8-horse truck or grader twice as fast as horses can do it and will, of course, work continuously all day long, which horses cannot do. As it operates twice as fast as teams, it accomplishes more than 16 horses and when equipped with a road-builder body with a tail gate arranged to open to any desired width and allow gravel to be uniformly spread from 2 to 6 inches deep over the roadway as the truck advances, an additional advantage of economy is effected.

AMERICAN-LA FRANCE FIRE ENGINE COMPANY INCORPORATED

During August, this company made 46 shipments of pumping engines, combination cars, trucks and tractors to cities in 15 different states. During the same period, they made sales of 62 similar items of equipment to cities in 25 different states and in New Brunswick, Ontario and Manitoba.

PERSONALS

Thomas, Carl C., has been appointed Western representative of Dwight P. Robinson & Co., New York, with offices in Los Angeles.

Lawson, Wilfrid S., has been appointed bridge and structural engineer for the Department of Railways and Canals, Ottawa.

Johnston, Major E. N., Corps of Engineers, U. S. A., in charge of work in the Wilmington District, will also take charge of work in the Baltimore District.

Banks & Craig, consulting engineers, have opened their new offices at 134 East 44th street, New York.

Eisenhardt-Conkey Co., Evansville, Ind., recently organized, will specialize in highway, drainage and mining engineering.

Burton, George L., has been appointed a member of the New Jersey State Highway Commission.

Bernhagen, L. O. sanitary engineer, has accepted a position with the city of Beaumont, Texas.

Baker, Ira O., professor of civil engineering, has been appointed acting head of the civil engineering department of the University of Illinois.

Willard, Arthur Cutts, Professor of heating and ventilation, University of Illinois, has been appointed dean of the department of mechanical engineering.

Bell, Lt.-Col. James Franklin, Corps of Engineers, U. S. A., at New Orleans, has been appointed to take charge of the Pittsburgh District.

Hicks, Craddock & McKay, recently organized, will conduct a general engineering business in Centralia, Wash.

Breed, Joshua B. F., has been appointed chief engineer of the new sewer commission of Louisville, Ky.

R. H. Beaumont Co., contractor for conveying and hoisting systems and complete power plants, has opened an office at 230 Fifth avenue, Pittsburgh, Pa., with Thomas Widdop in charge.

DAVID CHAUNCEY SHEPARD

David Chauncey Shepard, who for 46 years has been actively engaged in contracting, railroad building and engineering died at St. Paul Aug. 7. At the age of 19 he was employed in the construction of the Genesee valley canal and four years later in 1851, on the Rochester & Genesee Valley R. R. after which he was successively chief engineer of the Atlantic & Great Western, the Minnesota & Pacific, and the Chicago Milwaukee & St. Paul railroads.

During his career he built 7026 miles of railroads and in 1882-3 he built 675 miles of railroad on the Canadian Pacific line in 15 months a record which he afterwards exceeded by building 643 miles of the Great Northern Ry. in North Dakota and Montana at the rate of 100 miles per month with a force of 9,000 men and 3,500 teams.